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Part II

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SD 72-SH-0001

A STUDY OF SPACE SHUTTLE STRUCTURAL INTEGRITY TEST AND ASSESSMENT

**Final Report
Part 2**

**R.E. Anderson - R.G. Poe
January 1972**

Prepared for

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER, FLORIDA**



**Space Division
North American Rockwell**

APPENDIX A

MICROPHONE RESPONSE CURVES FROM THE INITIAL NOISE TESTS

140 DB

Brüel & Kjær
Capacitors

Measuring Object M-1

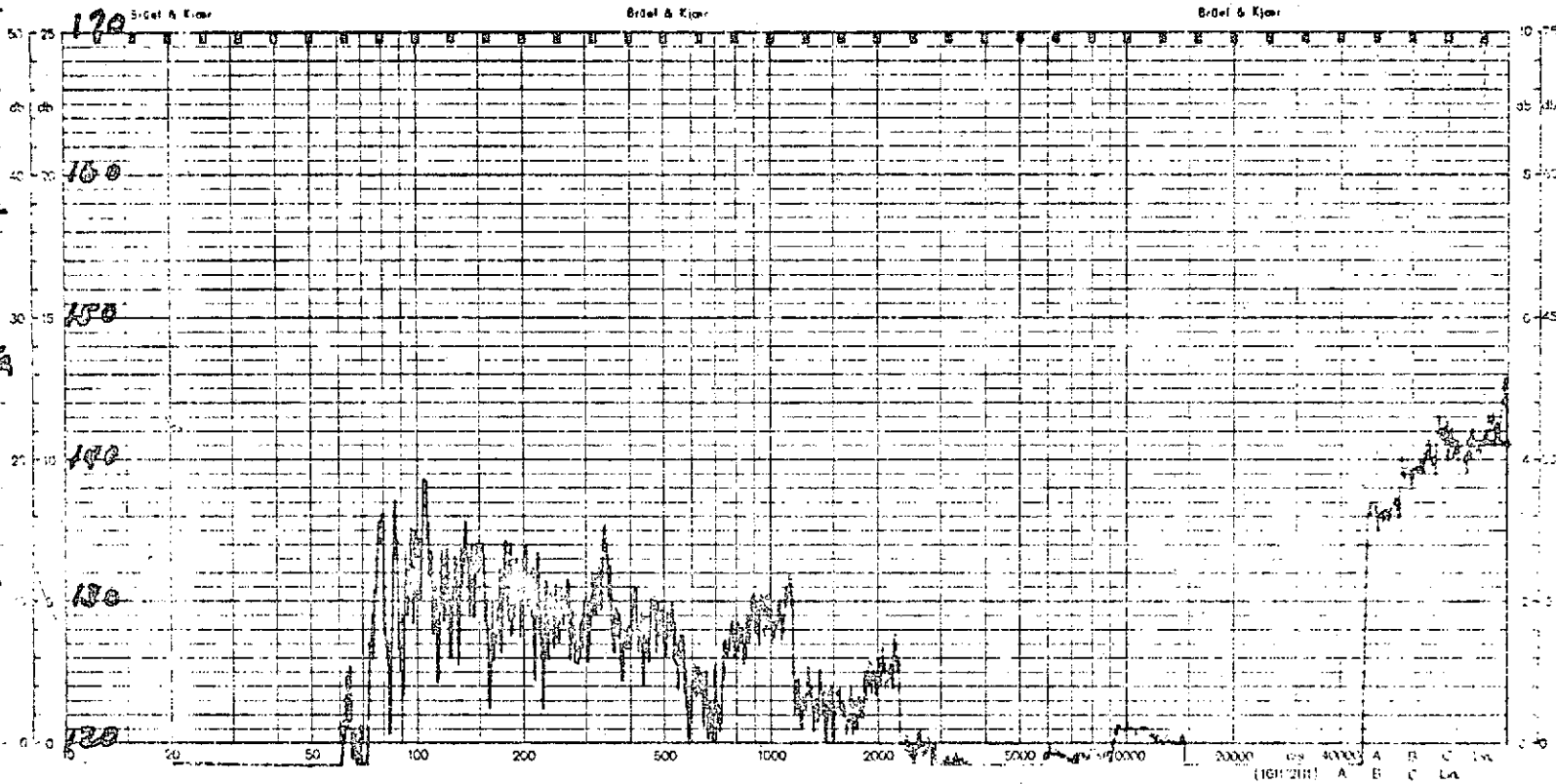
Level 1

ROTORCRAFT
CANISTER

SP. ML. 48 9/8

Rec. No. A-27-71
Date 8-27-71
Sign: CS
Rmt: RMS
Zero Lev: 120 dB
L Lim Fr: 20 Hz
H Lim: 5000 Hz
Wt Scl: 100 Hz
Proc Scl: 9 Hz
Multiply Freq. Scale by 1

OP 1123



A-1

SD 72-SH-0001

145 DB

Brüel & Kjær
Copenhagen

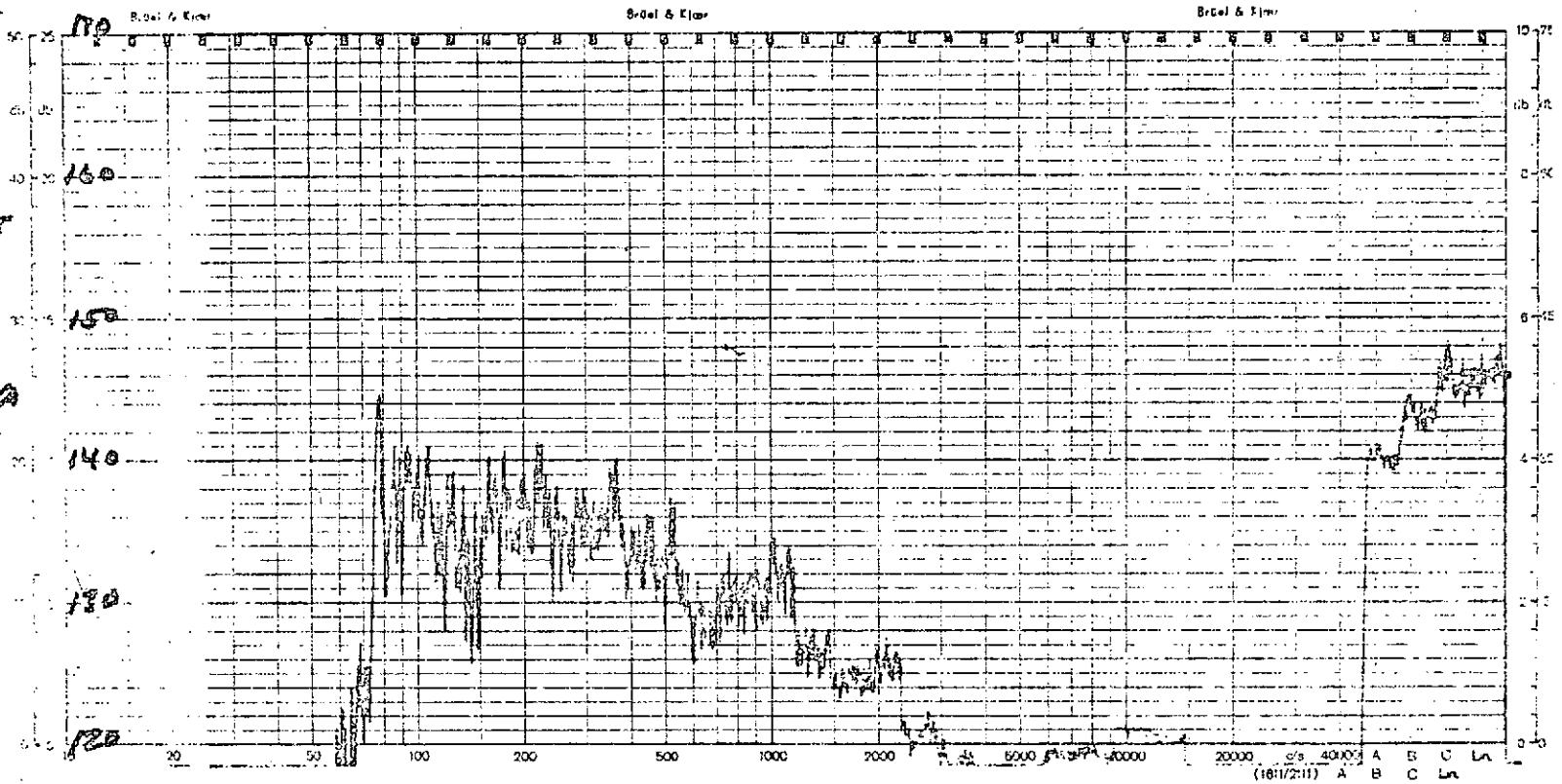
Measuring Object: M-1

Level 2

REVERBERANT
CHAMBER

SEL 11660 9A

Rec. No. _____
Date 8-27-71
Signal CO
Ref. 205
Zero Cal. 120 dB
L. Lim. Fr. 20 Hz
F. Lim. 5000
Wt. Co. 100 Hz
Power Co. 100 Hz
Multiply From Graph by 1
OP 1123



A-2

SD 72-SH-0001

150 DB

Bridel & Kjer
Copenhagen

Measuring Object M-1

Level 3

REVERBERANT
CHAMBER

SR 157.68 QA

Roc No.
Date B-27-71

Sign:

Pin:

Zero:

L Lim:

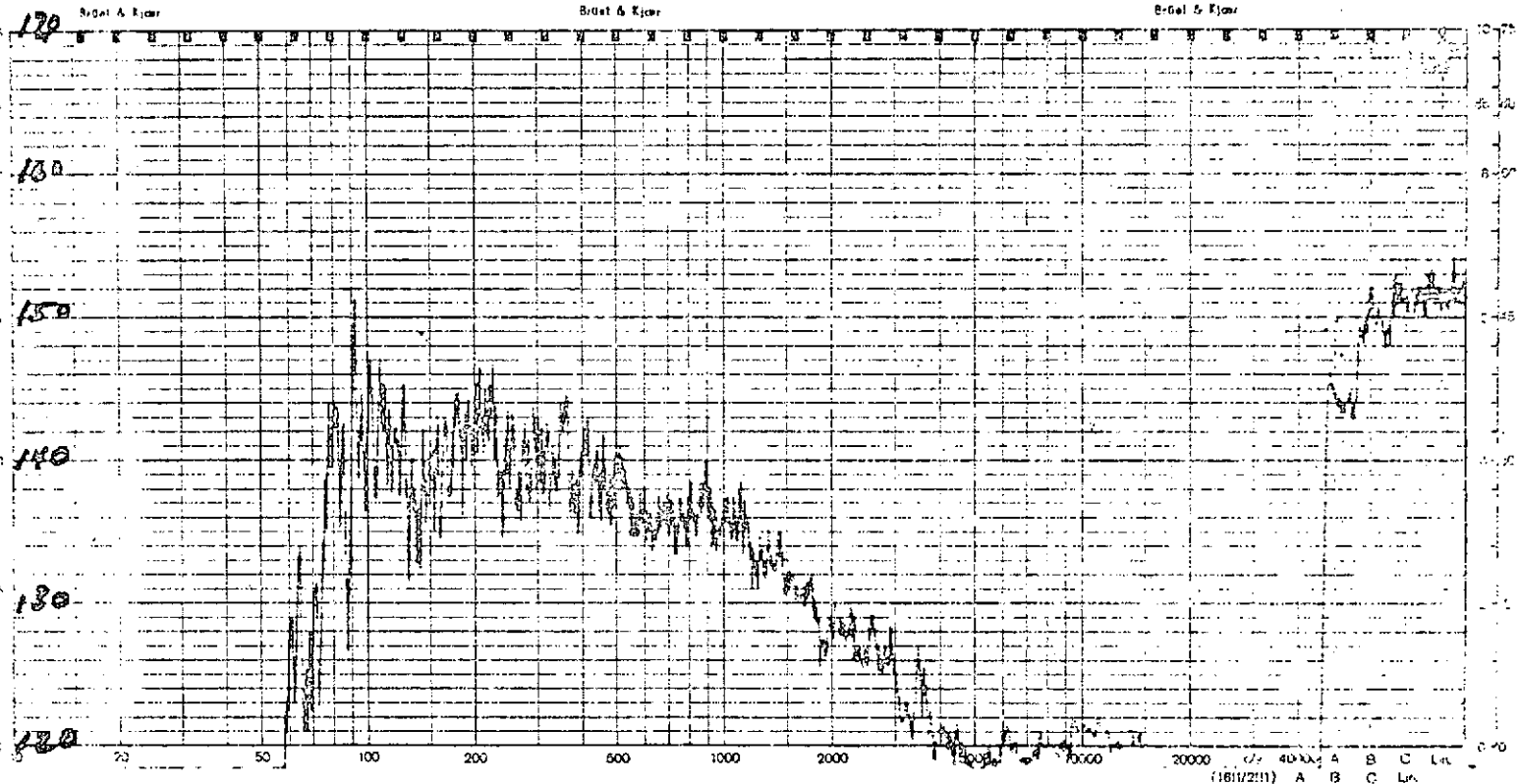
Pos:

Wt. Sp:

Paper:

Multiply From Scale:

OF 1123



A-3

SD 72-SH-0001

155 DB

Brüel & Kjær
Cooperstown

Measuring Unit: **M-1**

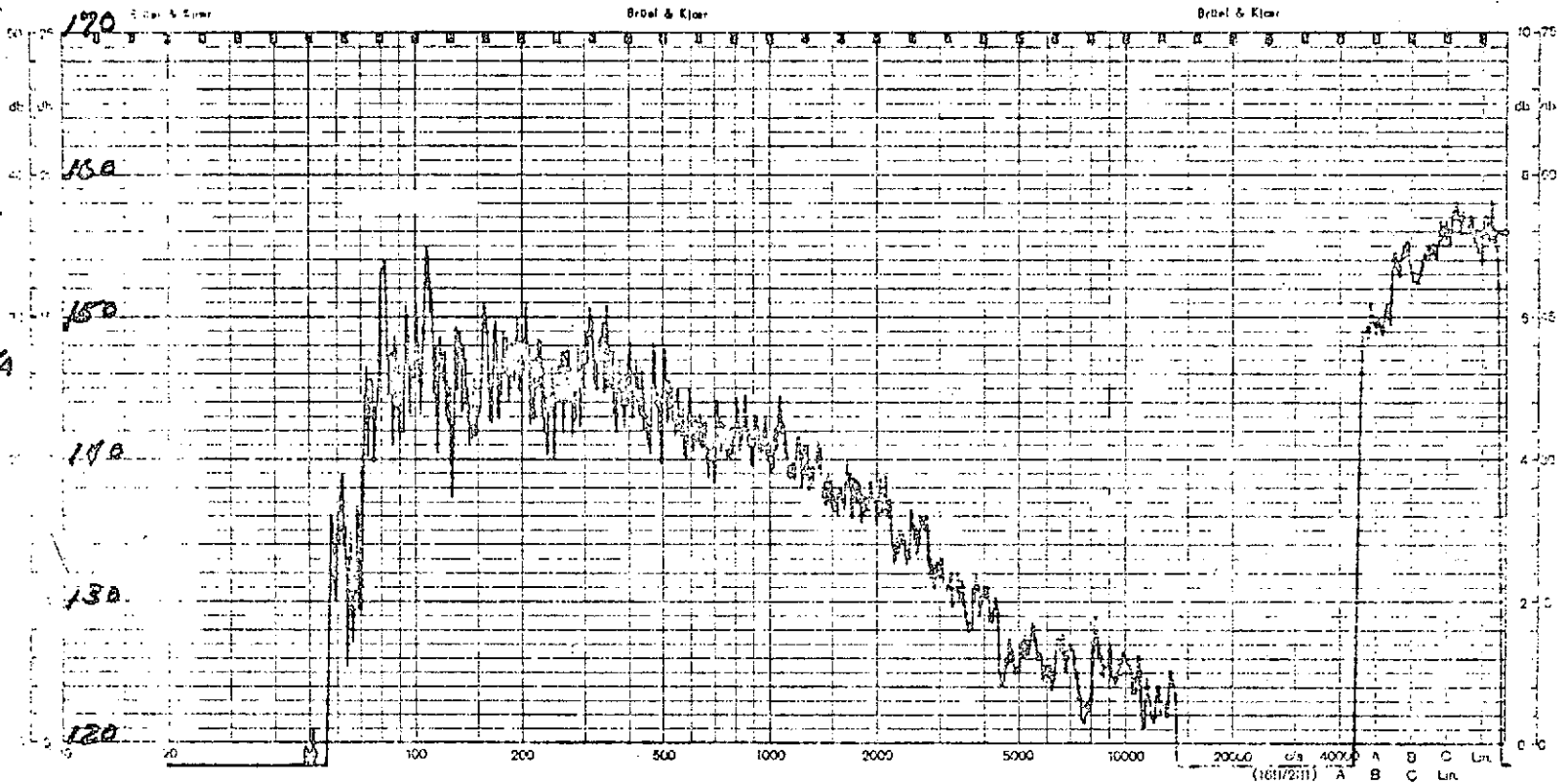
Level 4

**REVERBERANT
CHAMBER**

SPL 156 DB OA

Rec No: **8-27-71**
Date: **20**
Sign: **RMS**
Ref: **120 dB**
Zim Low: **20 Hz**
L Lim Fr: **5000**
Pr: **100 mm**
Wt Sp: **3 mm**
Multi Freq: **1**

OP 1123



A-4

SD 72-SH-0001

160 DB

Brüel & Kjær
Copenhagen

Measuring Object: *M-1*

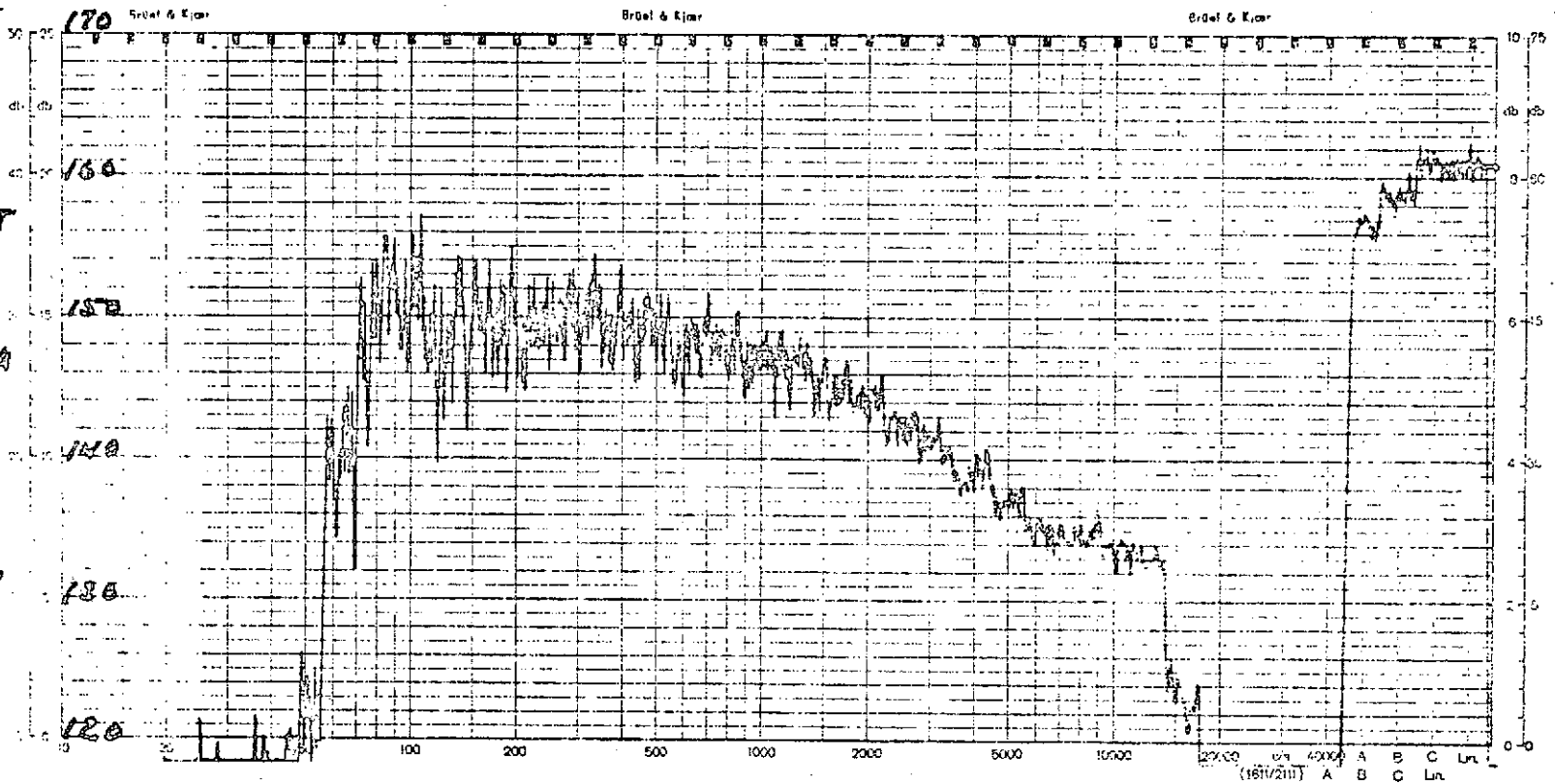
Level 5

*REVERBERANT
CHAMBER*

SPL 161 dB SA

Rec No.
Date: *B-27-71*
Sign: *CD*
Rec: *RMS*
Zero: *120 dB*
L. Lim: *20 Hz*
H. Lim: *50 kHz*
W. F.: *100 Hz*
Paper Sp.: *5 mm*
Multiply (from 1/100): *1*

OP 1123



Space Division
North American Rockwell

A-5

SD 72-SH-0001

13
12

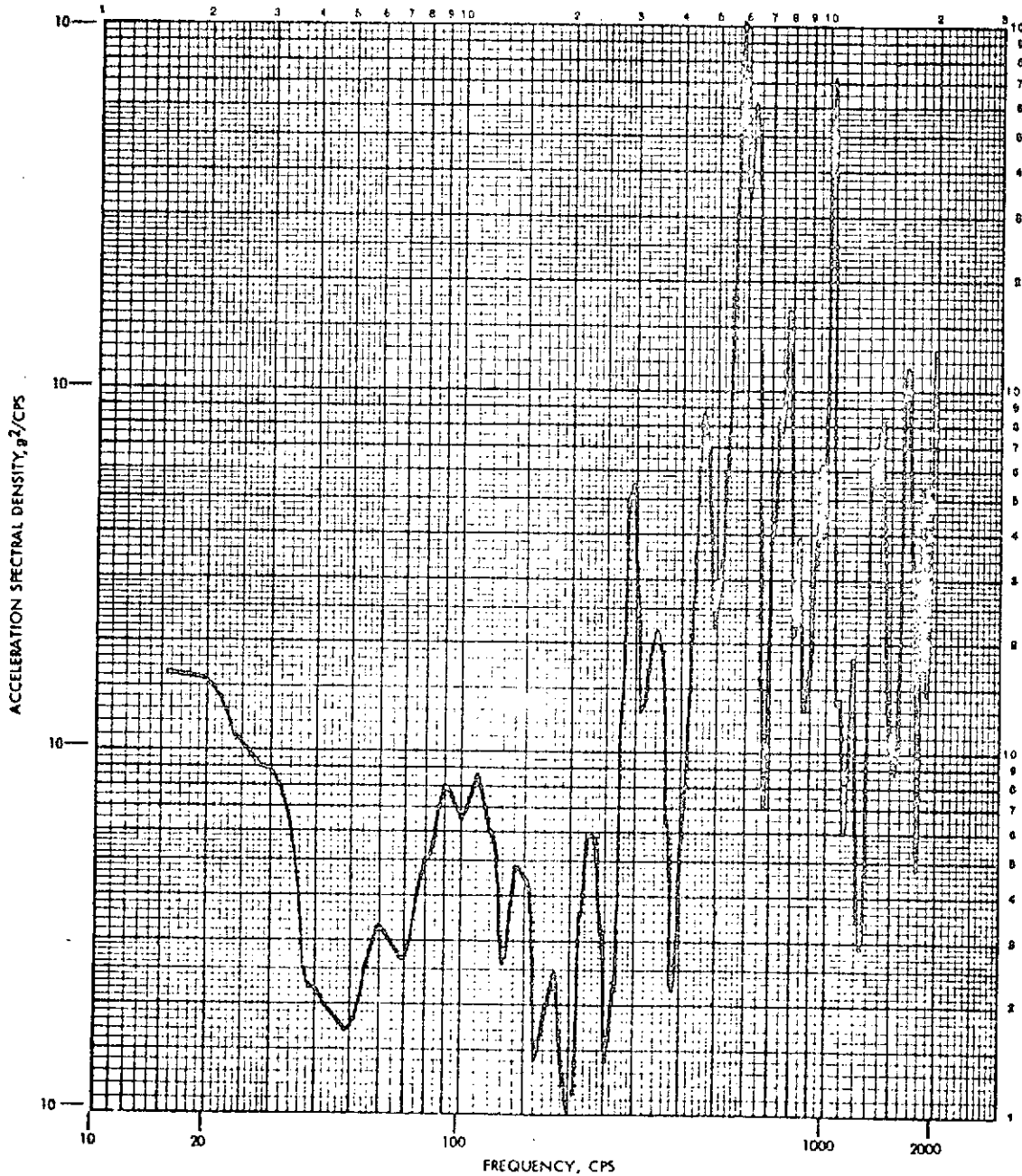
APPENDIX B

ACCELEROMETER RESPONSE CURVES FROM FINAL NOISE TESTS



RANDOM

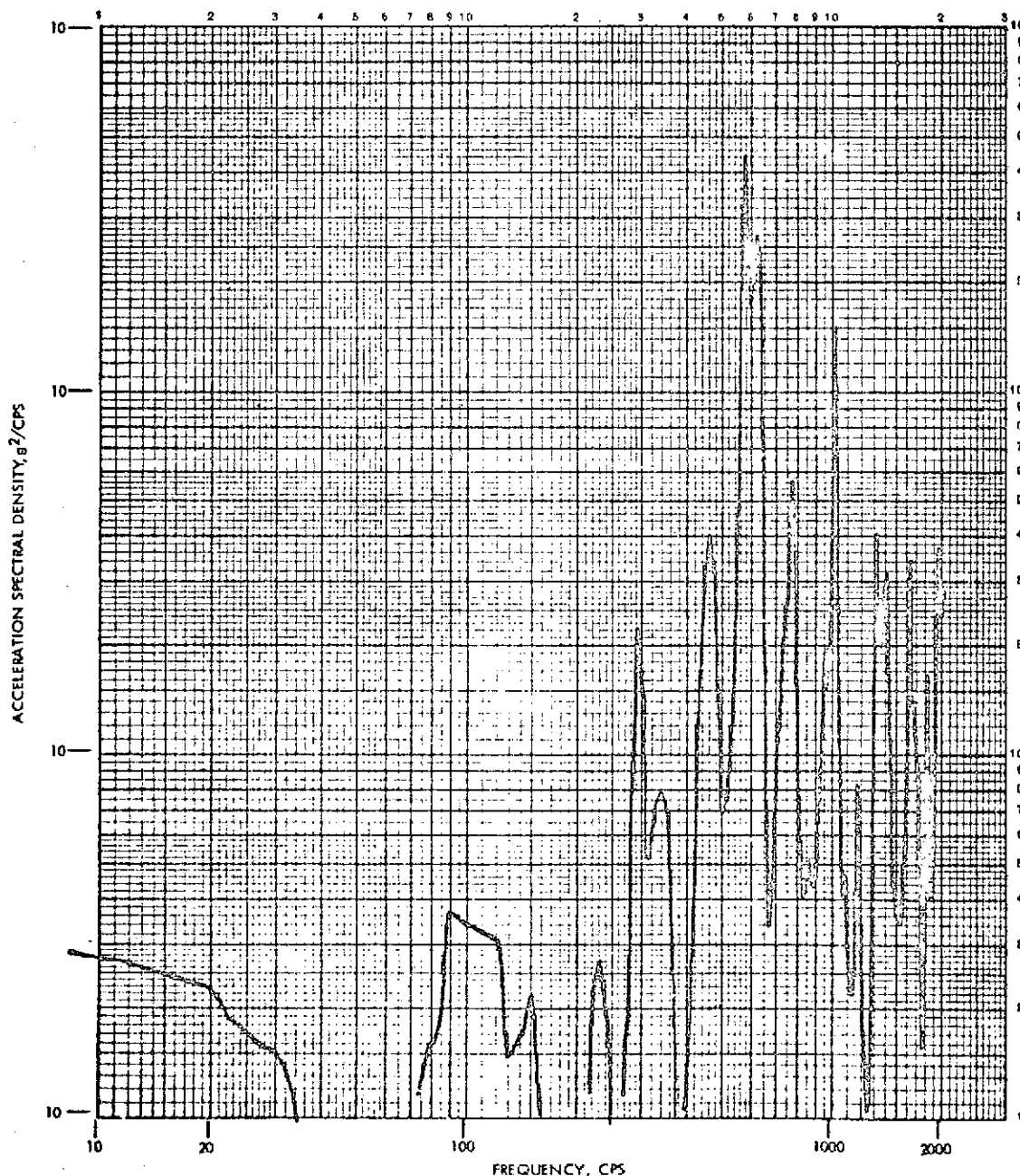
LR 9354 MEASUREMENT NUMBER R1 RUN NUMBER 01
TR _____ CONTROL (), RESPONSE () AXIS ACOUSTIC DATE 12-17 19 71
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 5.5 SAMPLING 140 dB Level
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 0.1 g²/CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-22-71 SPECIMEN P/N _____
REMARKS _____ S/N _____





RANDOM

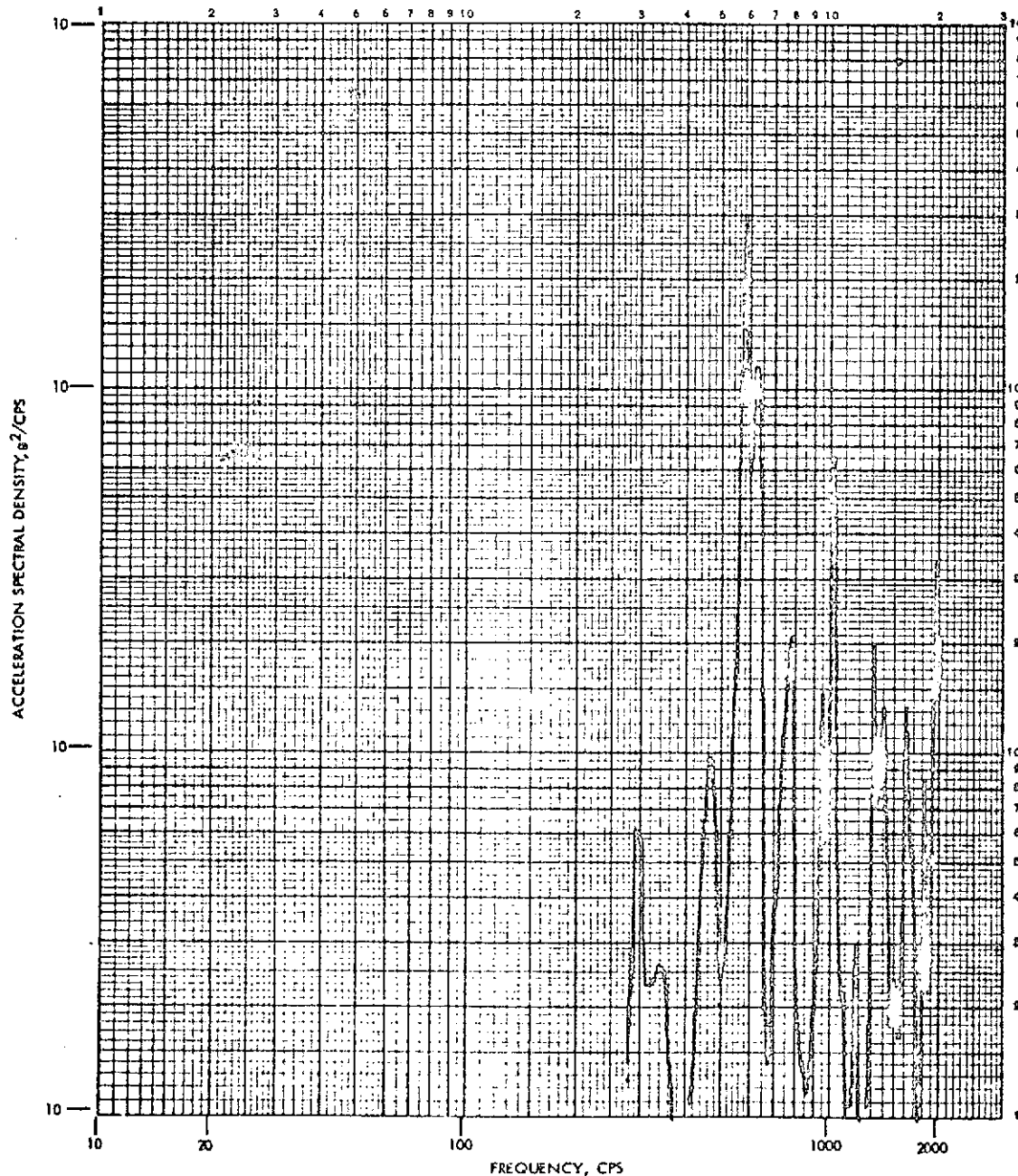
LR 9354 MEASUREMENT NUMBER 01 RUN NUMBER 01
TR _____ CONTROL () , RESPONSE (☒) AXIS ACOUSTIC DATE 12-17 19 71
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 8.5 SAMPLING 145 db LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 1.0 g^2 /CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-22-71 SPECIMEN P/N _____
REMARKS _____ S/N _____





RANDOM

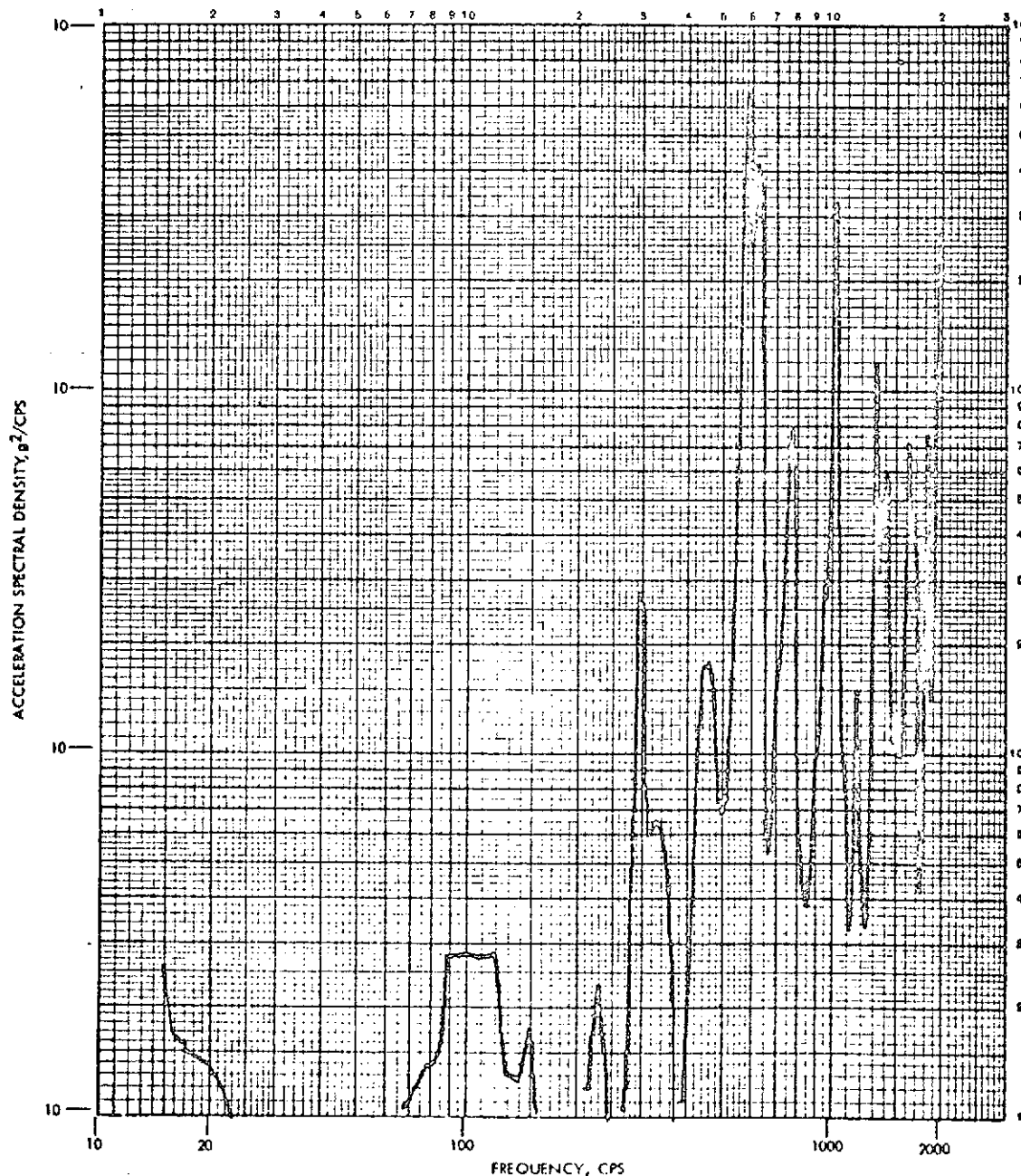
LR 9354 MEASUREMENT NUMBER B1 RUN NUMBER 01
TR _____ CONTROL (), RESPONSE () AXIS ACOUSTIC DATE 12-17 1971
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 17.0 SAMPLING 150dB LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 10.0 2/ CPS AVG TIME _____ SEC
OPERATOR W.W. 12-22-71 SPECIMEN P/N _____
REMARKS _____ S/N _____





RANDOM

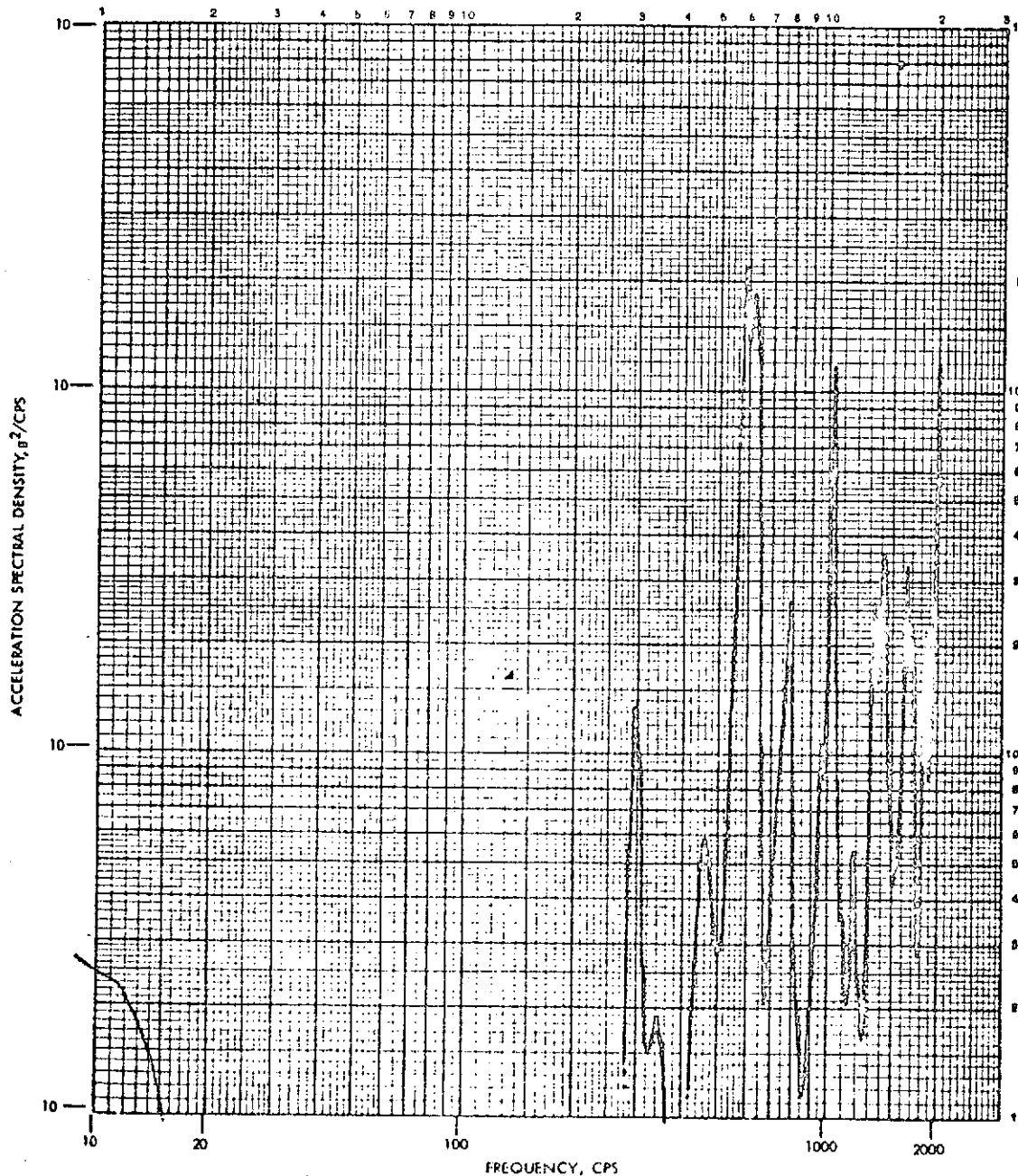
LR 9354 MEASUREMENT NUMBER 01 RUN NUMBER 01
TR _____ CONTROL (), RESPONSE () AXIS ACOUSTIC DATE 12-17 1971
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 37.0 SAMPLING 155 dB LEVEL
FILTER BW 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 10.0 g^2 /CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-22-71 SPECIMEN P/N _____
REMARKS _____ S/N _____





RANDOM

LR 9354 MEASUREMENT NUMBER 81 RUN NUMBER 01
TR _____ CONTROL (), RESPONSE (☒) AXIS ACOUSTIC DATE 12-17 19 71
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 96.0 SAMPLING 160dB LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 100.0 2/CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-22-71 SPECIMEN P/N _____
REMARKS _____ S/N _____

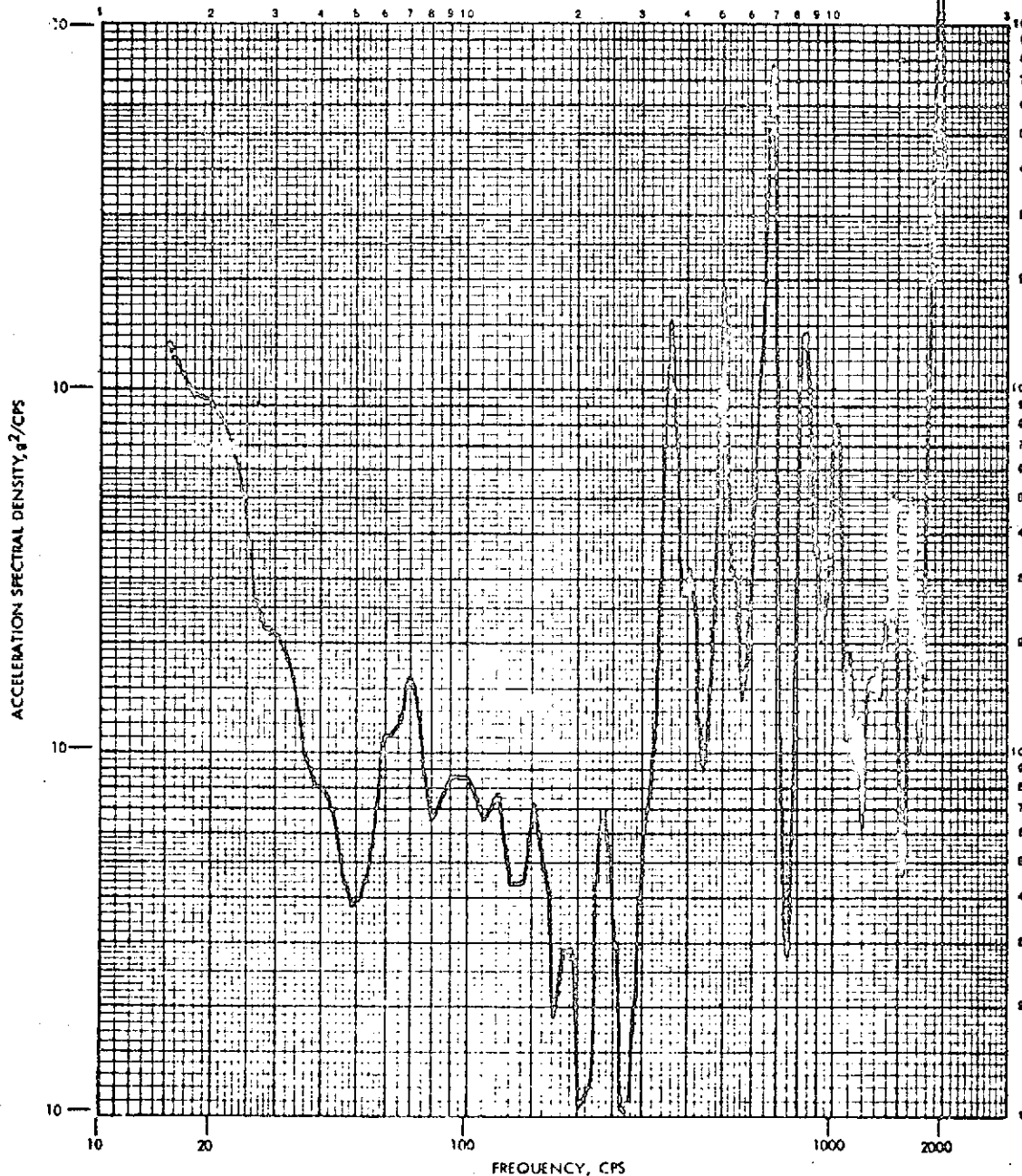


Form 2974-N Rev 8-67



RANDOM

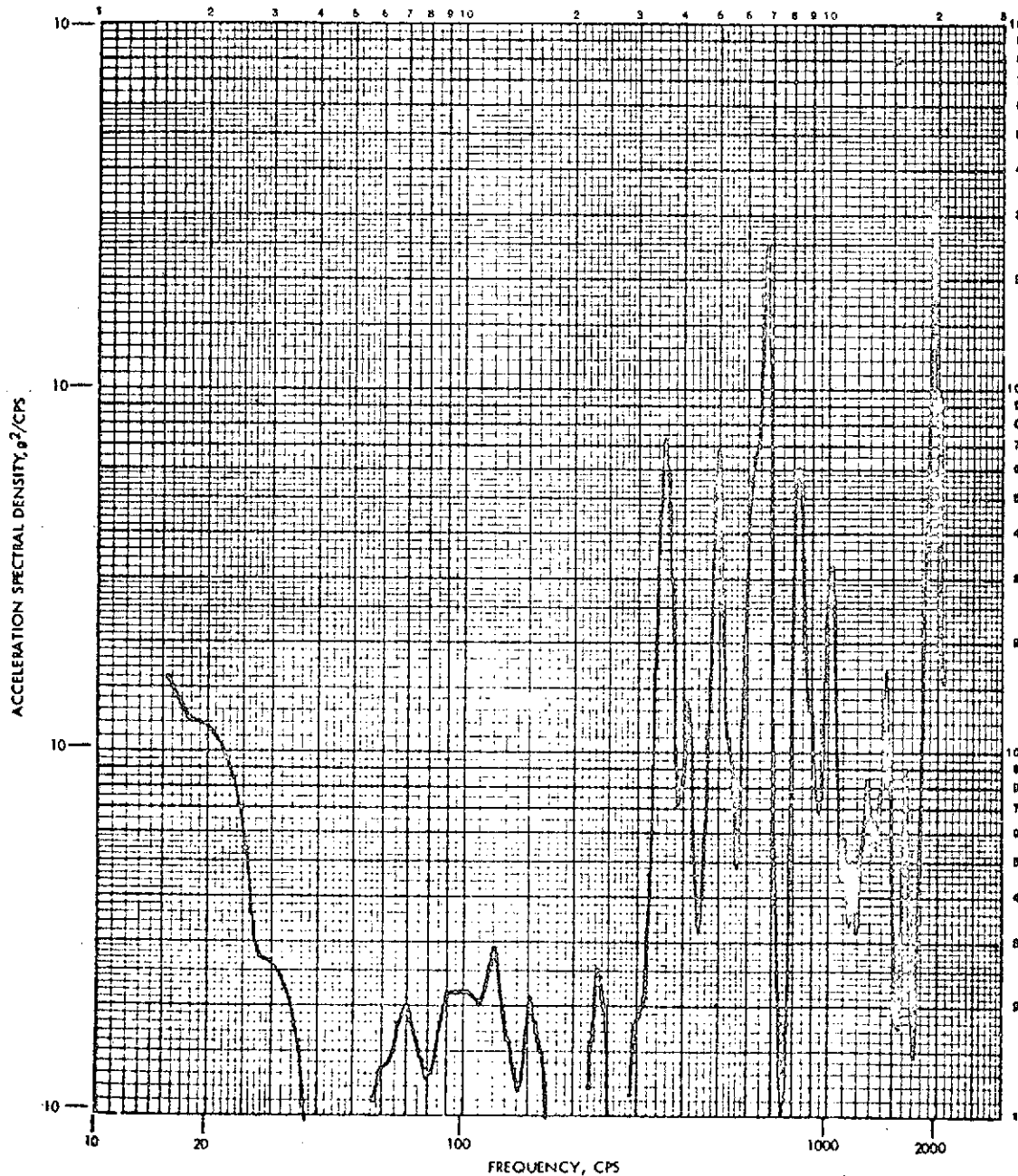
LR 9864 MEASUREMENT NUMBER 81 RUN NUMBER 03
TR _____ CONTROL (), RESPONSE () AXIS ACOMPTIC DATE 12-17 19 71
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 6.5 SAMPLING 140 dB LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 0.1 2/ CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-22-71 SPECIMEN P/N _____
REMARKS _____ S/N _____





RANDOM

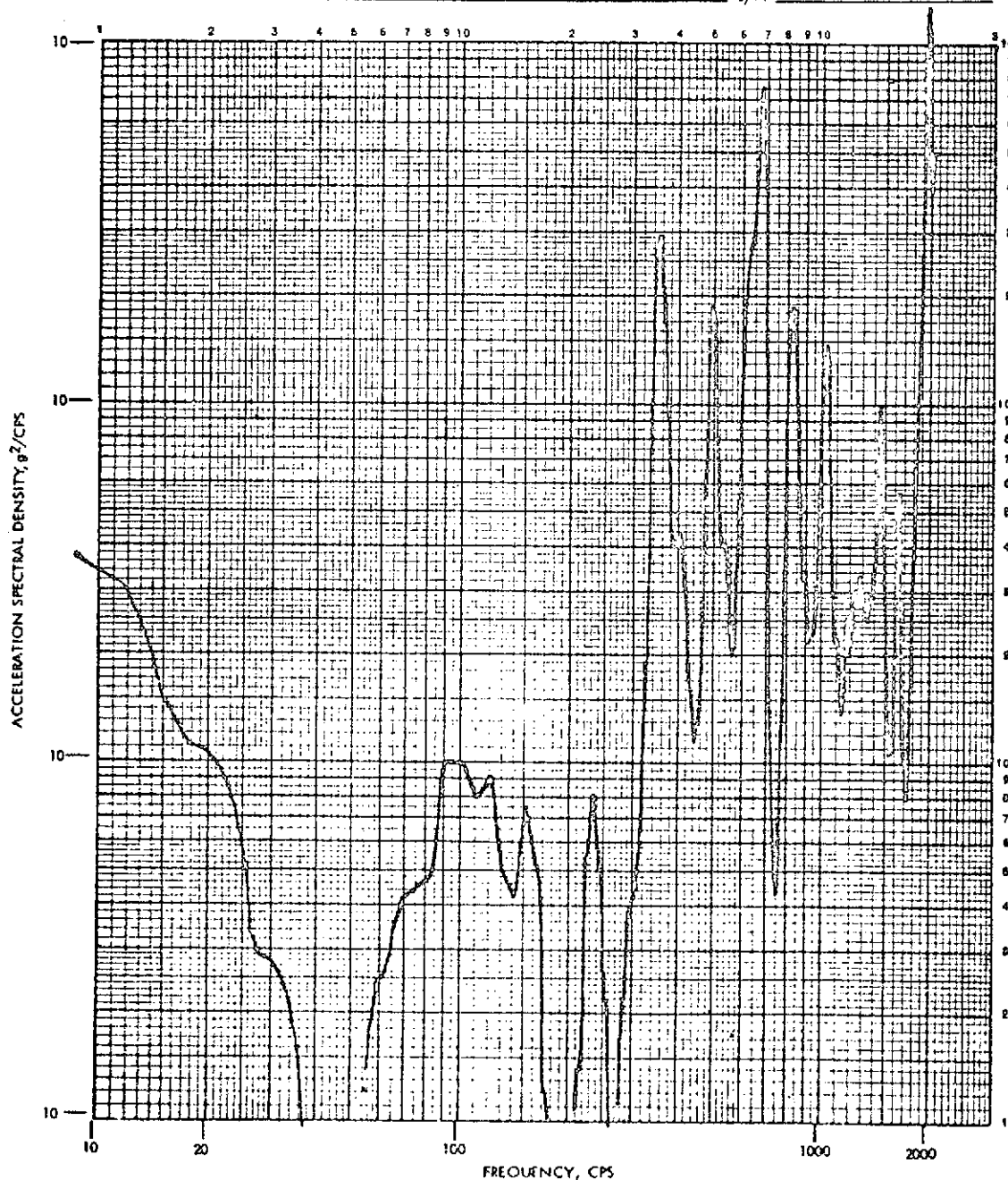
LR 9354 MEASUREMENT NUMBER A1 RUN NUMBER 03
TR _____ CONTROL () RESPONSE () AXIS ACOUSTIC DATE 12-17 19 71
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 8.6 SAMPLING 145dB LEVEL
FILTER BW: 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 1.0 g^2 /CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-22-71 SPECIMEN P/N _____
REMARKS: _____ S/N _____





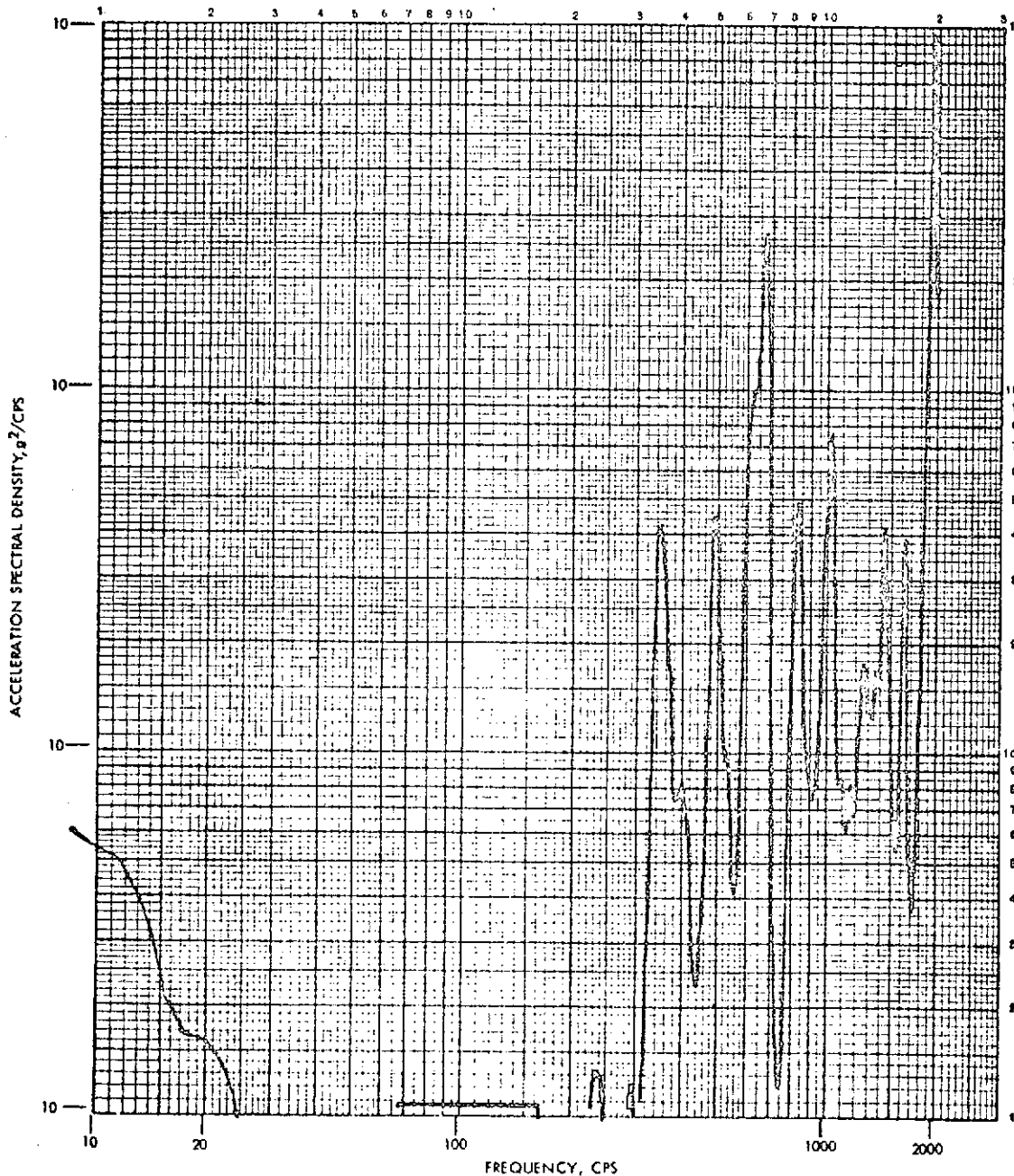
RANDOM

LR 9354 MEASUREMENT NUMBER 01 RUN NUMBER 03
TR _____ CONTROL (), RESPONSE () AXIS ACOUSTIC DATE 12-17-71
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 12.0 SAMPLING 150 dB LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 1.0 g^2/CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-22-71 SPECIMEN P/N _____
REMARKS _____ S/N _____



RANDOM

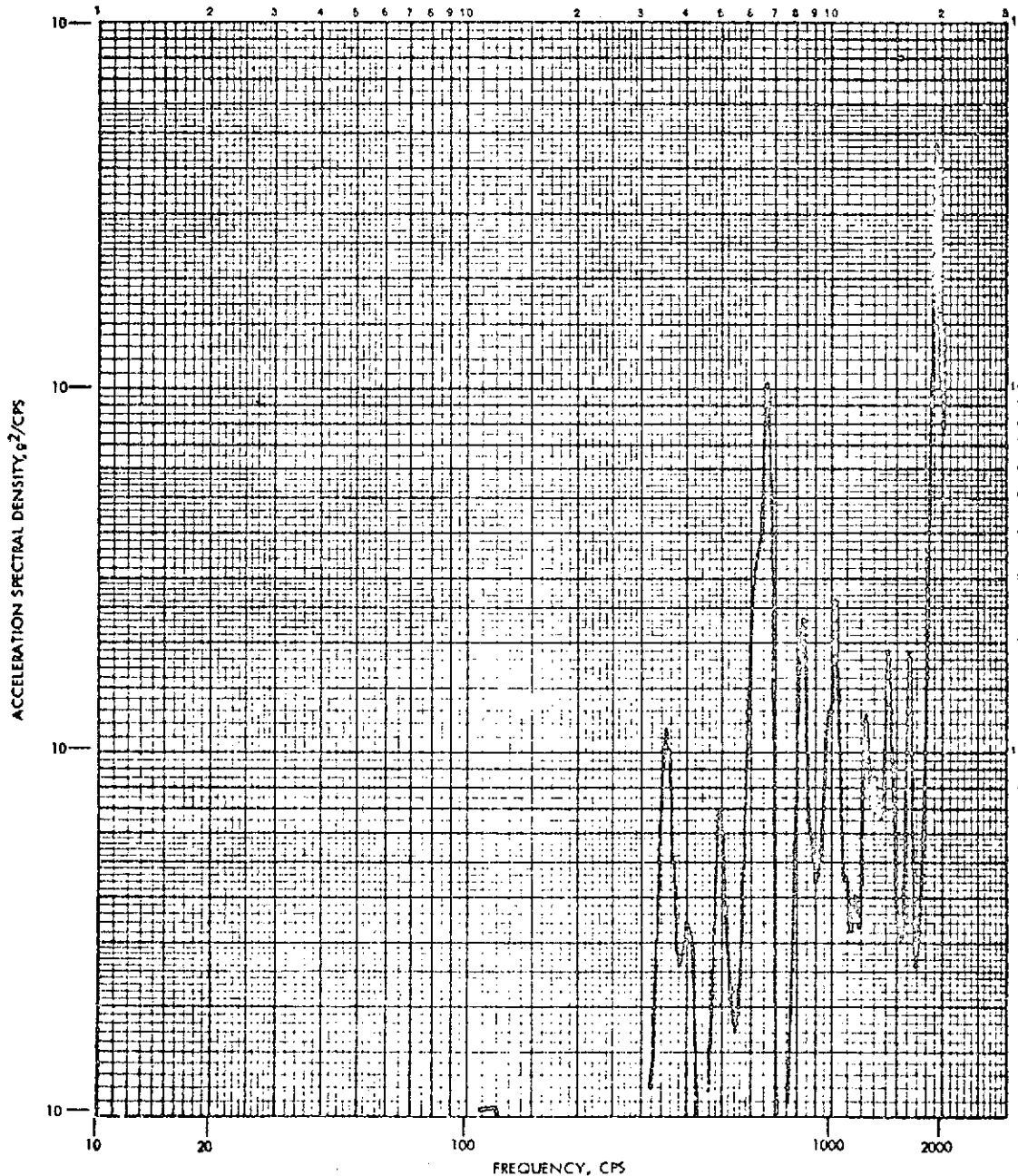
LR 9004-100 MEASUREMENT NUMBER A1 RUN NUMBER 03
 TR CONTROL (), RESPONSE () AXIS ACOUSTIC DATE 12-17 19 71
 TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
 OVERALL G RMS 37.0 SAMPLING 155 DB LEVEL
 FILTER BW, 15.0 CYCLES LOOP TIME SEC
 SWEEP SPEEDS SEC CROSSOVERS CPS
 FULL SCALE 10.0 2/CPS AVG TIME 6.4 SEC
 OPERATOR W.W. 12-22-71 SPECIMEN P/N
 REMARKS S/N





RANDOM

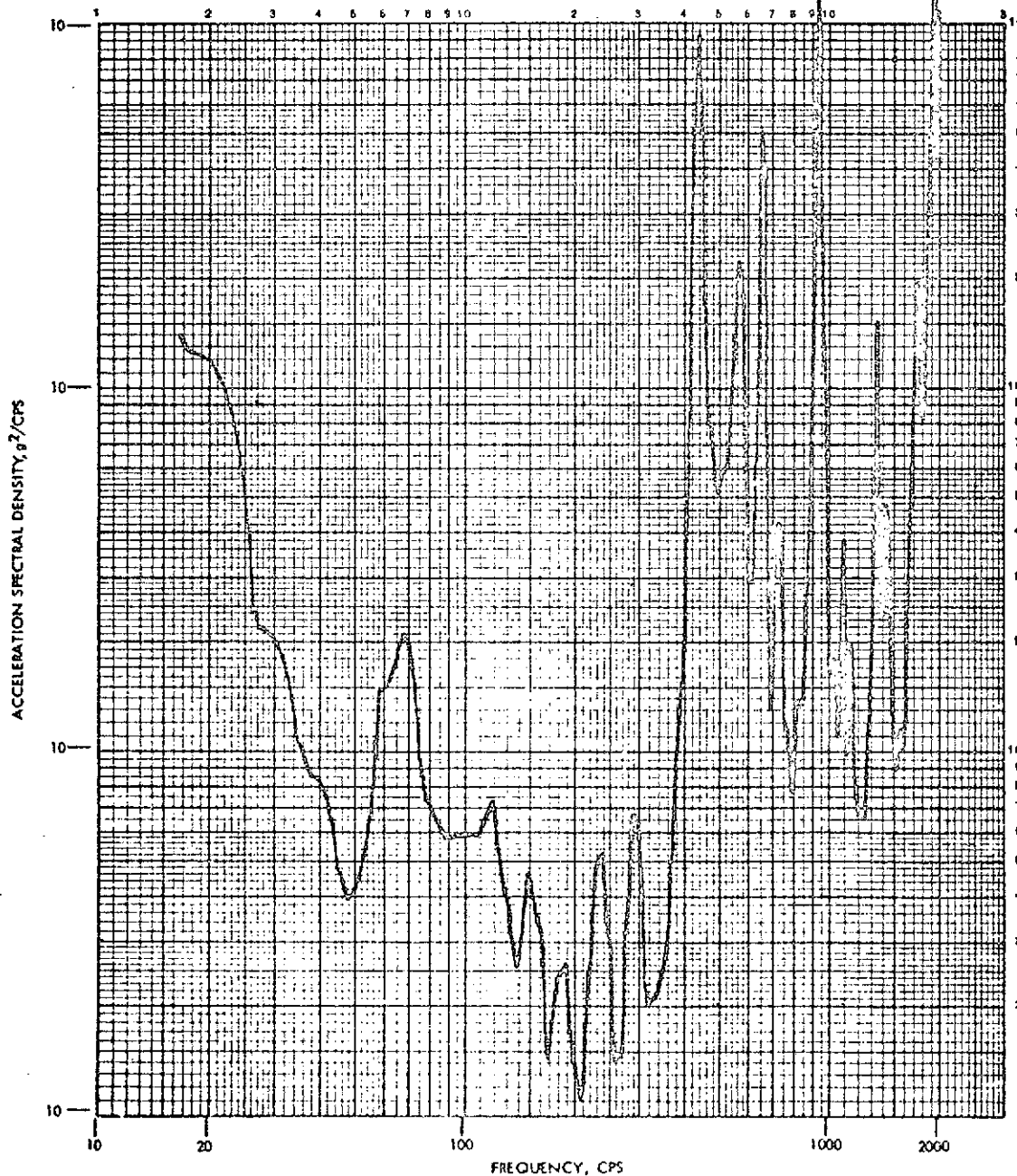
LR 9354 MEASUREMENT NUMBER A1 RUN NUMBER 03
TR _____ CONTROL (), RESPONSE () AXIS ACOUSTIC DATE 12-17 1971
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 95.0 SAMPLING 160 dB LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 100.0 g^2 /CPS AVG TIME 6.4 SEC
OPERATOR W. W. 12-22-71 SPECIMEN P/N _____
REMARKS _____ S/N _____





RANDOM

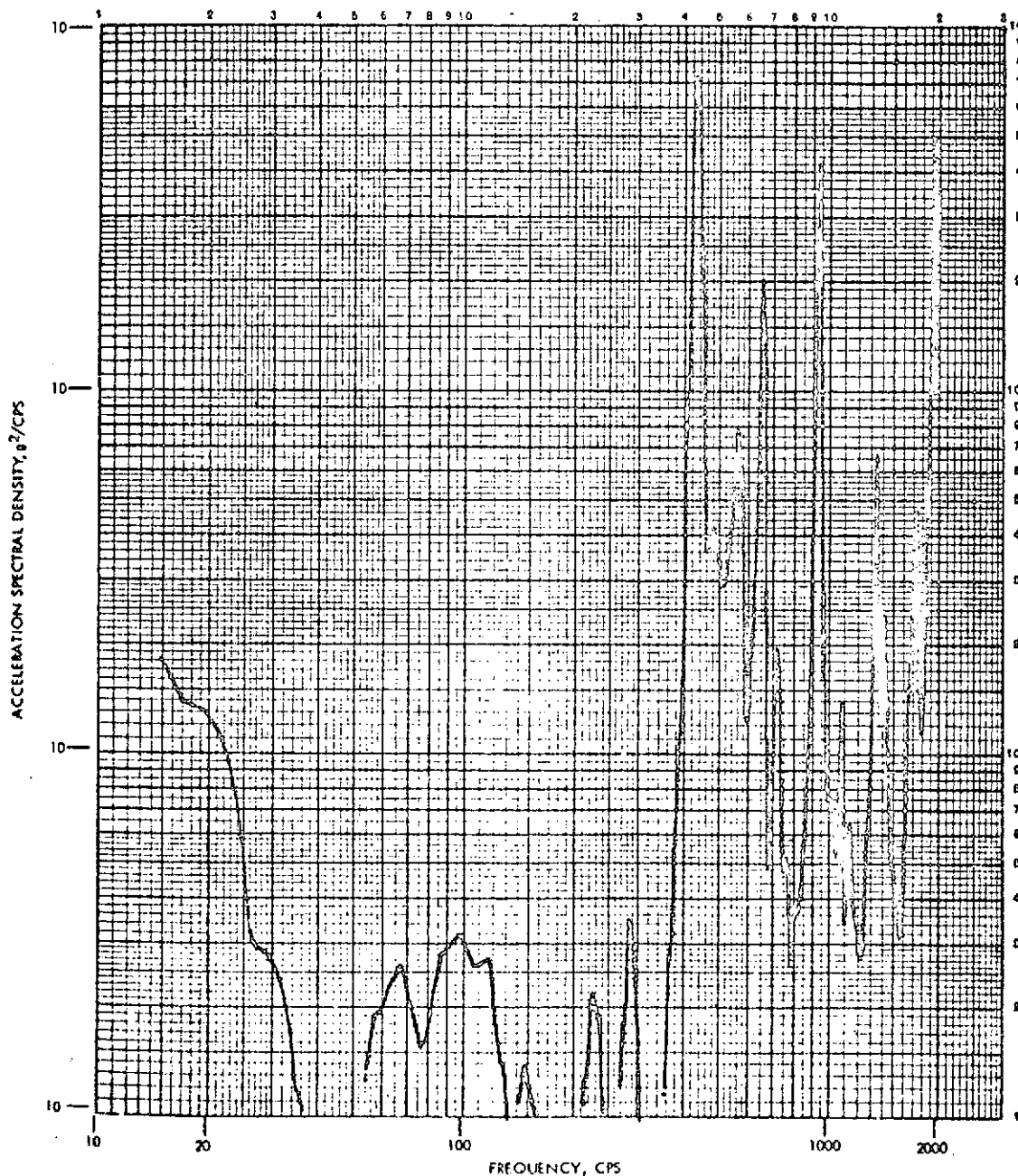
LR 9354 MEASUREMENT NUMBER B1 RUN NUMBER 05
TR _____ CONTROL (), RESPONSE () AXIS ACOUSTIC DATE 12-17 1971
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 7.5 SAMPLING 140dB LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 0.1 g²/CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-21-71 SPECIMEN P/N _____
REMARKS _____ S/N _____





RANDOM

LR 9154 MEASUREMENT NUMBER A1 RUN NUMBER 05
TR _____ CONTROL (), RESPONSE () AXIS ACOUSTIC DATE 12-17 1971
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 10.5 SAMPLING 145 dB LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 1.0 2/CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-21-71 SPECIMEN P/N _____
REMARKS _____ S/N _____

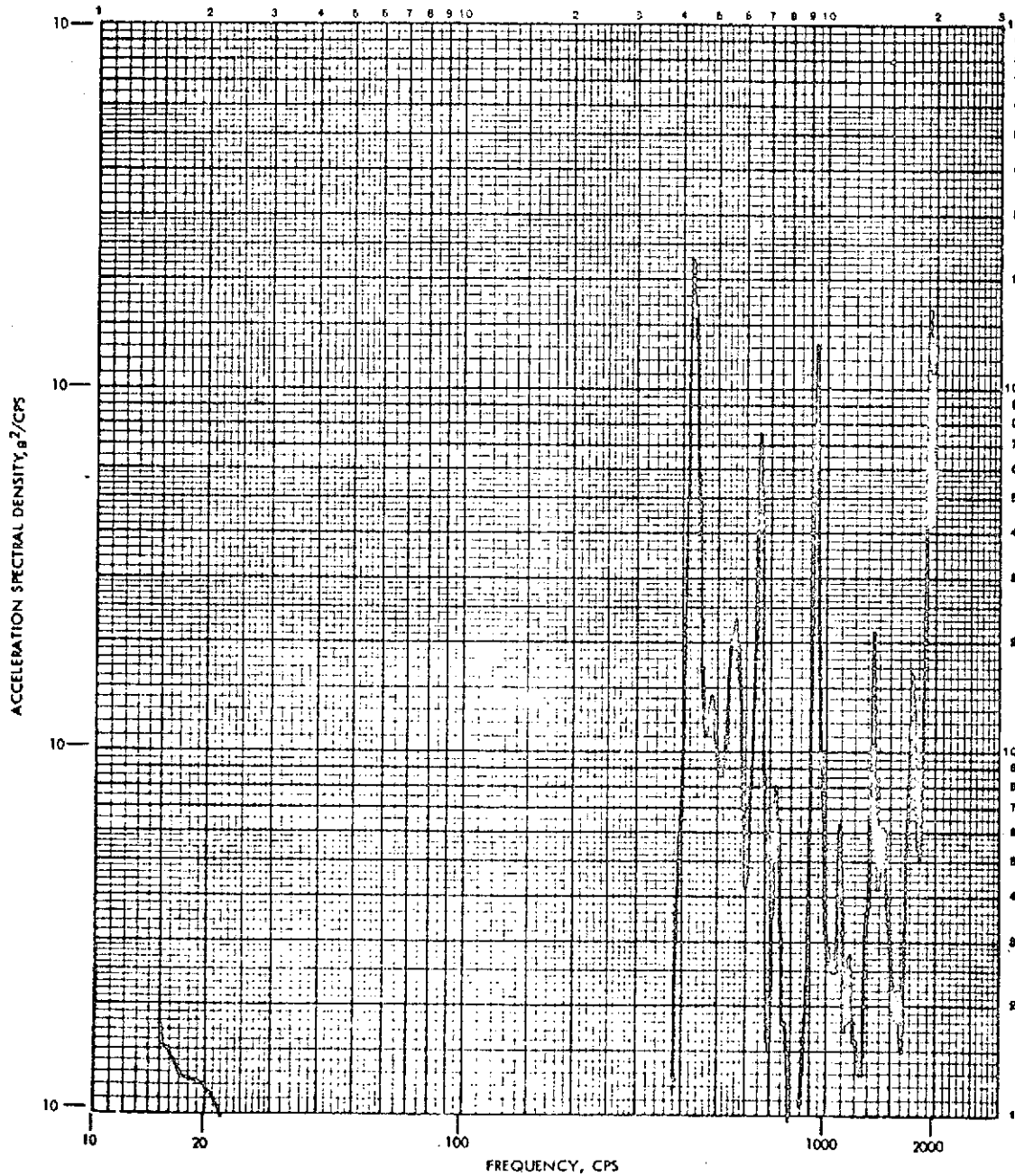


FORM 2934-1 Rev B-67



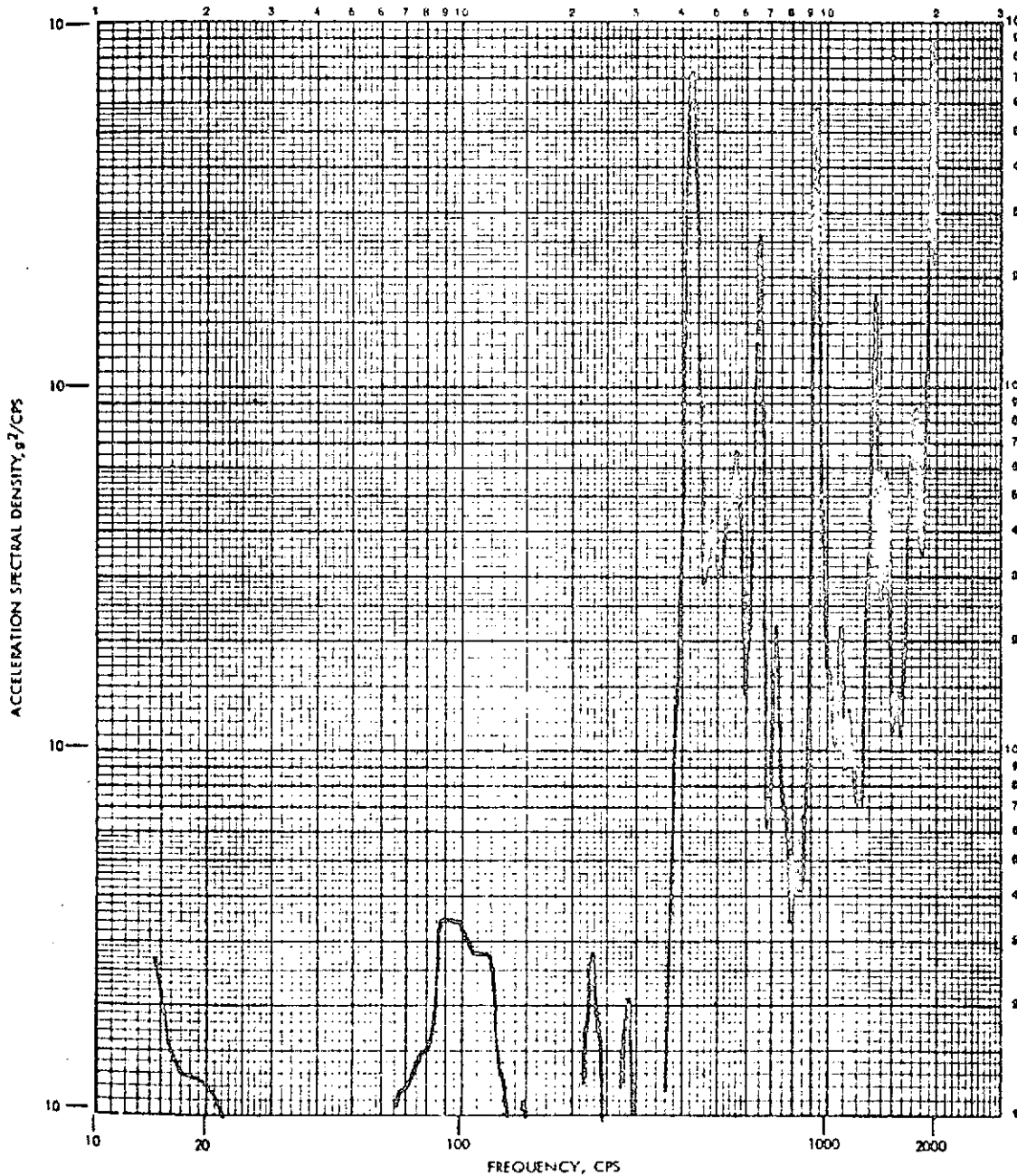
RANDOM

LR 9354 MEASUREMENT NUMBER 81 RUN NUMBER 05
TR _____ CONTROL (), RESPONSE () AXIS ACOUSTIC DATE 12-17 19 71
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 21.0 SAMPLING 150 dB LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 10.0 g^2 /CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-21-71 SPECIMEN P/N _____
REMARKS _____ S/N _____



RANDOM

LR 9854 MEASUREMENT NUMBER 81 RUN NUMBER 05
 TR _____ CONTROL (), RESPONSE (L) AXIS ACOUSTIC DATE 12-17 19 71
 TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
 OVERALL G RMS 46.0 SAMPLING 155 dB LEVEL
 FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
 SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
 FULL SCALE 10.0 g^2/CPS AVG TIME 6.4 SEC
 OPERATOR W.W. 12-21-71 SPECIMEN P/N _____
 REMARKS _____ S/N _____

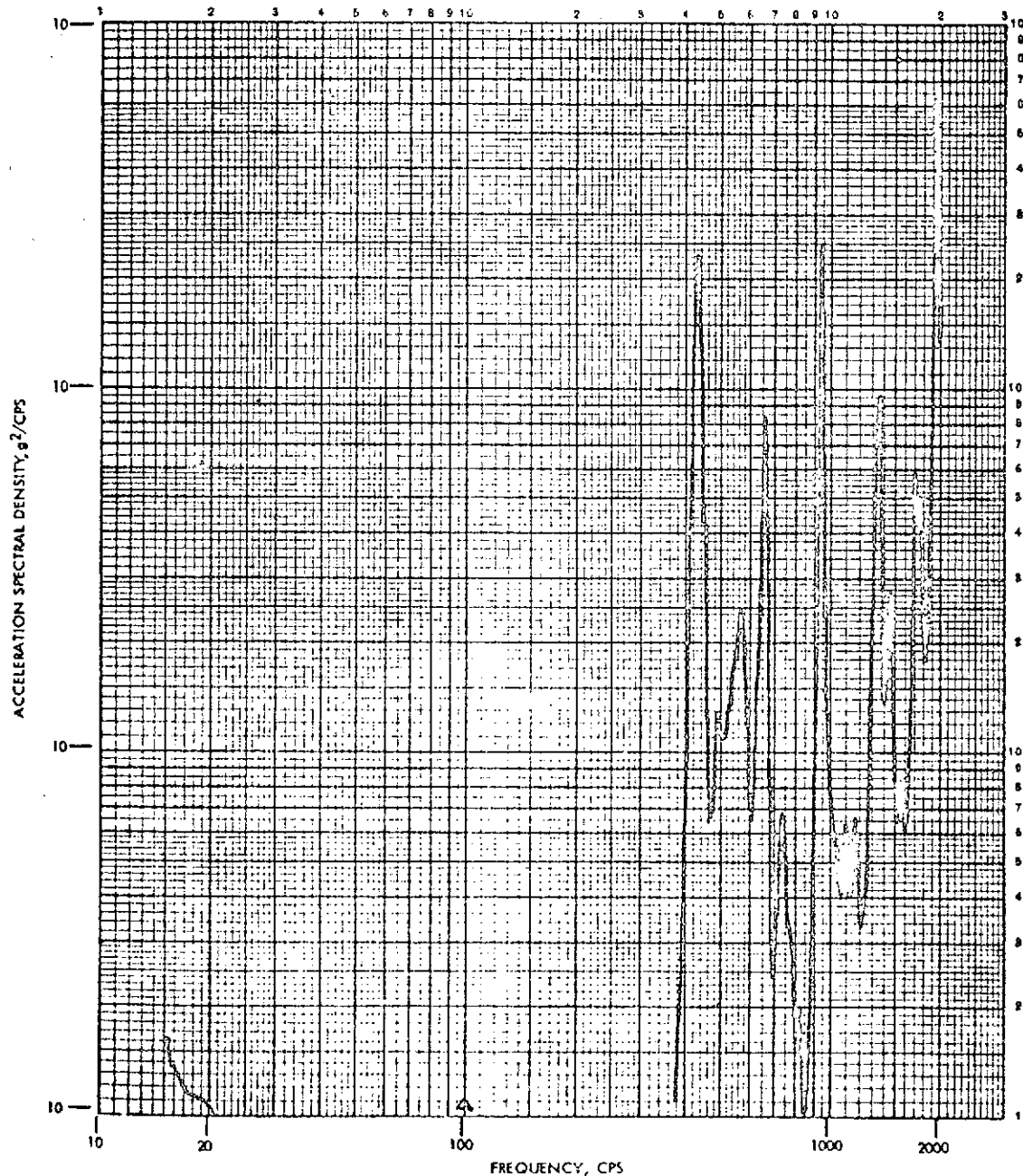


FORM 2874-N Rev 8-67



RANDOM

LT 9354 MEASUREMENT NUMBER R1 RUN NUMBER 05
TR _____ CONTROL (), RESPONSE (W) AXIS ACOUSTIC DATE 12-17 19 71
TEST TITLE SPACE SHUTTLE ULTRASONIC TRANSDUCERS
OVERALL G RMS 100.0 SAMPLING 160 dB LEVEL
FILTER BW, 15.0 CYCLES LOOP TIME _____ SEC
SWEEP SPEEDS _____ SEC CROSSOVERS _____ CPS
FULL SCALE 100.0 2/ CPS AVG TIME 6.4 SEC
OPERATOR W.W. 12-21-71 SPECIMEN P/N _____
REMARKS _____ S/N _____



Form 774-1 Rev 8-67

APPENDIX C

MICROPHONE RESPONSE CURVES FROM
FINAL NOISE TESTS

